Guidelines for New and Existing Continuously Operating Reference Stations (CORS)

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Table of Contents

Summary of Updates 3
Introduction 4
Procedures for Becoming a CORS Site 4
Definitions 4
A. General Site Operator Requirements 5
B. Equipment 5
B.1. Antenna 5
B.2. Antenna Radome 5
B.3. Receiver and Power Supply 6
C. Monument 6
C.1. Location, Obstructions, and Radio Frequency Environment 6
C.1.a. Location 6
C.1.b. Obstructions 6
C.1.c. Radio Frequency Environment 6
C.2. Ground-based Monument 7
C.2.a. Pillar 7
C.2.b. Braced 7
C.3. Roof-based Monument 7
C.3.a. Building Characteristics 7
C.3.b. Location and Attaching to a Building 8
C.4. Attaching Antenna, Mount and Monument 8
C.5. Orienting Antenna 8
C.6. Antenna Cable 8
D. Equipment Settings, Data Archiving, and Communications 9
D.1. Antenna and Receiver Settings 9
D.2. Data Archiving and Communications 9
E. Site Metadata 10
E.1. Digital Photographs 10
E.2. Site Log 10
F. Assessment of National Versus Cooperative CORS 11
G. Information Needed for New Site Evaluation 11
H. Day-to-Day Site Operations 12
APPENDIX 1: Form for Evaluating a New CORS site 13
APPENDIX 2: Site Log Instructions 15

APPENDIX 3: Blank Site Log 19
APPENDIX 4: Sample Site Log 25

Summary of Updates

Guidelines Effective: 1 January 2006
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Revisions:

NGS welcomes comments on any part of these guidelines. In particular, any effects on how you currently operate your sites and on any future sites you plan to add. Please contact Giovanni Sella <giovanni.sella@noaa.gov> if you have comments.

Introduction

This document outlines requirements and recommendations for the selection and operation of continuously operating GPS stations in the Continuously Operating Reference Stations (CORS) network, managed by NOAA's National Geodetic Survey (NGS). The CORS network benefits from a multi-purpose cooperative endeavor involving more than 155 government, academic, commercial, and private organizations. Although the network is voluntary, operators participating in the CORS network must adhere to certain standards and conventions to ensure the quality of the network. CORS has a fundamental role in the establishment, definition and access to the National Spatial Reference System. Implementation of these guidelines aims to minimize GPS signal distortion and maximize the quality of calculated positions, in accordance with models used in processing GPS data, to obtain centimeter to sub-centimeter accuracy.

It should be emphasized that NGS will not automatically include a CGPS station in the CORS network simply because it meets the criteria described in this document. Selection will be made on a case-by-case basis; taking into account current CORS network coverage needs, the quality of data and robustness of communication of existing or potential nearby stations.

Procedures for Becoming a CORS Site

1) Ensure that the site meets all the criteria outlined in A-E.
2) Send e-mail to ngs.corscollector@noaa.gov with "New Proposed CORS Site" in the subject line; with a short description of the site, its location, and contact information.
3) Supply all the required information about the site as described in section G. Information Needed for New Site Evaluation.
4) Once all the information has been received, NGS's Site Selection Team (SST) will decide if the site needs any modifications and/or updated information, and if the site should be incorporated into the National or Cooperative CORS network. The committee will reply to the site operator with its decision, along with the form described in Appendix 1. The SST meets every 1 to 2 weeks.
5) The site metadata will be finalized and NGS will coordinate with the site operators to establish data flow and archiving of data, if the site is to become a National CORS.
6) NGS will begin analyzing the data and establish the official positional coordinates and velocity for the site.

Conventions and Definitions

The following conventions have been adopted for this document.

The term "must" means that compliance is required, the term "should" implies that compliance is not required, but is strongly recommended.

Monument: The structure (e.g., pillar, building, etc), including the mount, that keeps the GPS antenna attached to earth's surface.

Mount: The device used to attach the antenna to the monument.

Mark: This is a unique and permanent point on the monument to which the antenna reference point is measured, which must remain invariant.

Antenna Reference Point (ARP): The point on the exterior of the antenna to which NGS references the antenna phase center position.

Antenna phase center: The electrical point, within or outside an antenna, at which the GPS signal is measured. The realization of the phase center is determined by the set of antenna phase center

variations (PCV) corrections that have been adopted to account for the non-ideal electrical response as a function of elevation and azimuth angles.

Antenna eccentricity: Vertical and horizontal distance from the mark to the ARP.

A. General Site Operator Requirements

The site operator provides and maintains all CORS equipment. The site operator must inform NGS of any planned outages, changes in equipment and firmware -- **especially antenna, radome, and changes in the physical space surrounding the antenna** -- as quickly as they become known to the operator.

A CORS site is expected to have infrequent and short-lived power outages, high data quality and a lifetime of at least 15 yrs. The latter applies also to the critical volume of space around the antenna, especially above the ARP, that should remain undisturbed throughout the lifetime of the CORS site.

B. Equipment

Site operators must keep all receiver firmware updated, and inform NGS whenever updates occurs. NGS also strongly recommends that equipment be upgraded and/or replaced as the technology changes, e.g. new GPS signals added. Equipment changes should however be minimized as they have the potential of resulting in a change in position. If data quality decreases and the site operator is unable to replace equipment, upgrade equipment or otherwise mitigate a problem, NGS may choose to remove the site from the CORS network (See H. Day-to-Day Site Operations)

B.1. Antenna

- The antenna must be at least dual-frequency (L1 and L2).

- The NGS phase center model for the antenna model must be available. If the user chooses to install a radome (See B.2. Antenna Radome), an antenna phase center model for the antenna and radome pair must be available. The NGS database of calibrated antenna and radome combinations is available at: <http://www.ngs.noaa.gov/ANTCAL/index.shtml>.

WHY: A consistent phase center and ARP for the antenna is essential to tie the GPS measurements to the physical mark. Ignoring the phase center variations can lead to multi-centimeter errors. All analysis of GPS data at NGS requires that an NGS-validated phase center model is used to calculate the official positional coordinates for a CORS site.

B.2. Antenna Radome

NGS strongly recommends that no antenna radome be used.

WHY: It is well documented that an antenna radome changes the antenna phase center position over time. Its benefit is limited as antennas are constructed so they do not need the "protection" of a radome.

- The choice of material used, combined with the effects of UV radiation, as well as possible manufacturing in homogeneities in the thickness of certain radomes, may create additional problems in using a single PCV model for a particular radome model. These two problems imply that a time-dependent effect on the PCV exists as the radome deteriorates and a calibration of each individual radome is needed as a general model calibration would not be valid (See http://pasadena.wr.usgs.gov/scign/group/dome).

- If a radome is used, the antenna and radome pair must have been calibrated together by NGS (See B.1. Antenna).

B.3. Receiver and Power Supply

Receiver's must have/be able to:

- Dual frequency (L1 and L2).
- Track at least 12 satellites above 0 degrees.
- Automatically switch between operating modes to retain full wavelength L2 when Antispoofing (AS) is switched on.
- Provide L1 C/A-code pseudorange or P-code pseudorange and L1 and L2 full wavelength carrier phase.
- Sample at a frequency of 30-seconds or higher.
- Must have a robust power supply with a minimum of 5 minutes backup power, 30+ minutes preferred.

See D. Equipment Settings, Data Archiving, and Communications for specific receiver configuration requirements.

C. Monument

Since there is no "perfect" monument, these guidelines only aim to avoid designs that are known to or are likely to result in data quality issues, based on designs used in CORS/IGS during the last 12 years.

GOALS: First, ensuring the antenna is well anchored to the ground is essential so the position and velocity associated with a given site represents the crustal position and velocity at the site, not just the antenna. Second, minimize multipath and differences in antenna phase center position as compared to models used in data analysis.

C.1. Location, Obstructions and Radio Frequency Environment

C.1.a. Location

Choose an open area with minimal obstructions and likelihood of change in the environment surrounding the monument; e.g. avoid tree or shrub growth, building additions, rooftop additions, new antenna masts, satellite dishes, parking lots (cars coming and going), etc.

C.1.b. Obstructions

No obstructions 10 degrees above the horizon from the ARP and minimal obstructions from 0 to 10 degrees.

WHY: The greater the volume through which uninterrupted/unreflected signal can reach the antenna, the greater the likelihood of a robust position estimate. No lightning rods, RTK broadcast antennas, or any other objects should extend above the antenna or be anywhere within 3 m of the antenna and all should be below the 0 degree of the horizontal surface containing the ARP.

Operators are strongly recommended to insert a lightning arrestor in the antenna cable between the antenna and the receiver with its own independent ground. This should protect the receiver in the event of a lightning strike on or near the antenna. The following URL, may be helpful, and clearly indicates the potential signal loss created by a poorly selected arrestor.
<http://www.unavco.org/facility/project_support/permanent/equipment/ligtning/lemp_report.html>

C.1.c. Radio Frequency Environment

The signals received by CORS antenna and receivers can be detrimentally affected by the presence of interference from other radio frequency sources (e.g. TV, microwave, FM radio stations, cellular telephones, VHF and UHF repeaters, RADAR, high voltage power lines). This can cause additional noise, intermittent or partial loss of lock or even render sites inoperable. Every effort should be made to avoid proximity to such equipment now and in the future and all such equipment **must be documented in the site log**.

C.2. Ground-based Monument

C.2.a. Pillar

Should be approximately 1.5 m above the ground surface to mimic the geometry used at NGS' antenna phase center calibration facility. However, in light of possible obstructions (See C.1. Location, Obstructions, and Radio Frequency Environment), a taller monument may be necessary.

Have a deep foundation that extends at least 2 m below the frost line.

The top of the pillar **MUST** be narrower than the widest part of the antenna, and the smaller the surface the better. In constructing the pillar consider that future antennas may be smaller; hence the narrower the top of the pillar the better. The distance between the top of the pillar (if it has a surface) and the antenna should be less than 5 cm. This will allow enough room to manipulate a leveling and orienting device (See C.4. Attaching Antenna, Mount, and Monument). These recommendations apply to the top of the pillar only; a very narrow pillar would be unstable and not recommended (tapered pillars are good).

WHY: This will mitigate multipath issues. For construction of pillar type monuments consult the following web links: <http://www.ngs.noaa.gov/PUBS_LIB/PAT20/appndixa.pdf>
<http://www.ngs.noaa.gov/CORS/CorsPP/forum2004/ray_files/v3_document.html>
<http://www.pgc.nrcan.gc.ca/geodyn/wcda/monument.html>

C.2.b. Braced

These monuments are especially stable and well anchored to the ground, although more expensive than pillars. Extensive diagrams with details of all aspects of constructions are available at:
<http://pboweb.unavco.org/?pageid=45>
<http://www.unavco.org/facility/project_support/permanent/monumentation/deepdrilled.html>
<http://www.unavco.org/facility/project_support/permanent/monumentation/sdbm.html>

C.3. Roof-based Monument

C.3.a. Building characteristics

Only masonry buildings are permitted. Solid brick or reinforced concrete is recommended. The building should have been built at least 5 years previously, to increase the likelihood that all primary settling of the building has occurred. There should be no visible cracks on the outside or inside walls. Buildings taller than two stories are not recommended. No wood or simple metal frame with metal walled buildings, and no metal roofs.

WHY: This will minimize the effects of thermal expansion as well as multipath issues.
The following links are instructive but not exhaustive:
<http://www.cement.ca/cement.nsf/0/7427088E8CB2AFF285256BF30063F29C?OpenDocument>

<http://hyperphysics.phy-astr.gsu.edu/hbase/tables/thexp.html>
<http://www.masonryinstitute.com/guide/part4/construction_b2_pg1.html>

C.3.b. Location and Attachment to a Building

Stainless steel is recommended for longevity (Angle iron or circular pipe).

The mount must be bolted **directly** to the main part of the building, to a load-bearing wall near a corner is recommended.

Mounting on a chimney is not recommended unless it has been filled or if it is particularly robust.

The mount should not interfere with the building's replaceable roof. This will minimize the chance that when the roof is replaced the mount will be affected.

Attaching laterally to a load bearing wall:

- The mount should extend about 0.5m above the roofline and be attached to the building for a length of at least 1m, with at least 3 anchors/bolts. The ratio of freestanding part to bolted part should be 1:3.

- The bolts or anchors should penetrate directly through the mount, i.e. no u-bolts. The use of epoxy and threaded lock adhesives on fasteners is highly recommended. Spacers to keep the mount from sitting flush against the wall are acceptable.

Attaching vertically to a master wall:

- A bolt or rod must be anchored into a load-bearing wall. Take care not to void a roof warranty, and ensure that the mount will not be disturbed when the roof is replaced. Avoid metal flashing on a parapet wall.

C.4. Attaching Antenna, Mount and Monument

A device must exist between the monument and the antenna that allows the antenna to be leveled and oriented to north (See C.5. Orienting Antenna). If the antenna is changed, then the new ARP must be able to return to the same point in space as the previous ARP, or the change in position between the mark and the ARP must be measured to within 1 mm.

The antenna must be leveled to within 0.15 degrees or 2.5 mm/meter.

A number of devices exist that will do this:

<www.ngs.noaa.gov/CORS/Articles/modifying_a_tribrach.pdf>
<www.unavco.org/facility/project_support/permanent/equipment/mounts/levellingmount.html>
<www.unavco.org/facility/project_support/permanent/equipment/mounts/scignmount.html>

C.5. Orienting Antenna

The antenna must be oriented using the convention that the antenna cable threaded attachment is oriented to true North, unless the antenna has a different inscribed North point. Remember that declination is the angle between magnetic north and true north. A magnetic declination calculator for setting a compass correctly is available at:
<http://www.ngdc.noaa.gov/sed/geomag/Declination.html>

The declination used must be recorded in the log file (See E.2. Site Log).

WHY: All antenna phase center patterns assume an oriented antenna, and phase center values can differ between north and east by up to a centimeter.

C.6. Antenna Cable

The antenna cable should not be under tension. Looping the cable near the point where it is attached to the antenna, and then attaching the loop to the mount can avoid this problem. If the antenna cable is not encased in conduit, then care should be taken that it will not move around and be damaged. Take particular care at any point where the cable is subject to increased friction, e.g. edges, and egress points in and out of buildings or monuments. Typical GPS antenna cables for CGPS stations (RG213/RG214) have a signal loss of 9 db/100ft at 1Ghz. Total loss for installed length of cable at a CORS must be 9 db or less, implying a maximum cable length of 100ft/30m. If a longer cable is needed then a lower loss cable must be used (The type, manufacturer, and length of cable must be listed in the site log).

D. Equipment Settings, Data Archiving, and Communications

D.1. Antenna and Receiver Settings

Antennas must be inspected regularly for damage and dirt or debris must be removed.

Receivers must be kept programmed with the current antenna and receiver serial numbers and models.

Receivers must be configured (if firmware allows) so that no smoothing is applied to the observables.

Receivers must be configured to track all satellites regardless of health status.

WHY: The criteria used by the Department of Defense for designating an unhealthy satellite are not always applicable to certain CORS users.

D.2. Data Archiving and Communications

All file names and associated dates must be recorded with respect to GPS time (UTC minus approximately 13s) **NOT** local time.

Data must be recorded at 30, 15, 10, 5 or 1-second sampling intervals.

Receivers must be configured to track with an elevation cutoff of 5 degrees or 0 degrees (preferred) and log 24hr blocks of GPS time, or hourly blocks (preferred). Optimal configuration is to deliver data in real time to NGS.

All data must be made freely available to the public for distribution.

NGS must have Internet access to retrieve the data immediately after 24h GPS time or after the hour if logging hourly.

All data transfers between NGS and the site operators **must be done via Internet**.

If NGS retrieves the data from the operator the operator must have an ftp server that operates 24hrs a day.

National CORS Archiving	***Cooperative CORS Archiving***
NGS will create RINEX files that will be archived by NGS, indefinitely.	RINEX-2 formatted data must be stored on-line for a minimum of 30 days.
Raw data must be made available to NGS immediately after the hour if logging hourly, or after 2400h GPS time.	RINEX data must be made available to the public immediately after the hour if logging hourly, or 2400h GPS time.
Data must be stored on-line by the site operator	Directory structure for on-line RINEX files must

for NGS access for at least 14 days. Raw files should be archived as: something/yyyy/ddd/ssss/ssssdddh[mm].zip (see explanation of abbreviations below).	be: something/rinex/yyyy/ddd/ssss/ssssdddh[mm].zip (see explanation of abbreviations below)

Abbreviations used for archiving raw and RINEX files using the following convention:
Note: the raw files will obviously have the manufacturer specific extensions but should mimic this format as closely as possible.
ssssdddh[mm].yyt
ssss - the four-character site id (See E.2. Site Log)
ddd - the GPS day of year,
h - a letter that corresponds to an hour-long GPS time block (see below) or if 0 (zero) this is a full 24hr GPS time block.

00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18 19 20 21 22 23
a b c d e f g h i j k l m n o p q r s t u v w x

mm applies only to less than 1 hour data files and consists of the minutes after the hour that the file begins e.g. if 30 minute files are collected then 00 and 30 would be used.
yy - the GPS year
t - the file type as
o - observation
d - observation hatanaka compressed
m - meteorological
n - navigation
s - summary

E. Site Metadata

E.1. Digital Photographs

A set of sharply focused digital photographs, 800 dpi, is required to evaluate a site and to serve as permanent documentation of a site. When taking photographs, please consider that their purpose is to give a clear view of obstructions, and details of the monument to someone who has never seen your site. **These must be updated if the equipment changes or changes occur in the physical space around the antenna**. The photograph requirements are:

A photograph taken at the height of ARP surface or directly at the top center antenna, looking away from the antenna to the North, East, South, West directions (It is acceptable to include the antenna in the photograph but it should not significantly block the ability to view what lies behind the antenna).

A close-up photograph that shows how the antenna is attached to the monument.

A photograph showing the monument and antenna.

If the antenna is on a roof, you must include the following:

- A photograph showing "clearly" how the antenna is attached to the building.
- A photograph showing the antenna and the roof surface.
- A photograph showing the whole building and antenna.

A close-up photograph of the antenna showing its model and serial number.

A photograph of the receiver location.

A close-up photograph of the receiver showing its model and serial number.

E.2. Site Log

The site log used at NGS follows the format specified by the International Global Navigation Satellite System Service (IGS). This file contains all the historical information about a site and details about the equipment and monumentation of a site. **The site log is of equal importance as the GPS data collected at a site**. Detailed instructions are given in APPENDIX 2; a blank log is given in APPENDIX 3; and a completed example log is given in APPENDIX 3. Please fill out **ALL** parts for which you have information. DO NOT DELETE any empty or inapplicable sections. Please remember that these files must be "machine readable" and therefore should be saved as **ASCII files and have the exact spacing as described in the instructions** (APPENDIX 2). **Most entries can only be on one line,** if more information is needed please enter it in the Additional Information part of each section**.**

F. Assessment of National Versus Cooperative CORS

The main difference between National and Cooperative CORS is that for National CORS the user obtains the data from NGS (where it is archived), whereas if the site is Cooperative CORS the user gets the data from the site operator who must archive the data for a minimum of 30 days.

National	Cooperative
Station is operated 24 hours/day, 7 days/week	Station is operated 24 hours/day, 7 days/week
NGS makes all GPS data publicly available indefinitely	Site operator makes associated GPS data publicly available in RINEX format (30 days minimum on-line)
NGS produces RINEX files and ensures accuracy of RINEX headers.	Site operator produces RINEX files and ensures accuracy of RINEX headers.
NGS maintains web site, with all meta data (photos, station log, NGS position information)	Site operator maintains web site with all meta data (photos, station log, and link to NGS positional information) and a link to the NGS Cooperative CORS web page
CORS map located on NGS web site links to GPS data in NGS archive	CORS map located on NGS Web site links to GPS data on participant's web site
NGS checks positional coordinates daily	NGS checks positional coordinates daily
OPUS utility automatically selects three National CORS for calculating positions	OPUS utility allows manual user selection of up to three Cooperative CORS for calculating positions
For inclusion, the station must significantly enhance the functionality of the National CORS network in terms of coverage, data quality, reliability, latency, equipment quality, real-time data, etc.	Most stations are accepted

G. Information Needed for Site Evaluation (SST Committee)

- 3 days of raw 24hr files with UTC day of year included in the file name.
- Completed site log.
- All site photographs.
- OPUS position.

We will run additional checks on the raw data to check for data quality (see H.)

H. Day-to-Day Site Operations:

To ensure data quality the following verifications will be made on a daily basis:
TEQC (Translating, Editing, Quality Checking) will be used to check the quality of the incoming RINEX files. TEQC is freeware available for a variety of computer platforms and operating systems from: <http://www.unavco.org/facility/software/teqc/teqc.html>

Every day TEQC will be run to check the 24-hr RINEX files that have been decimated to 30-s epochs. The following parameters will be checked:

- MP1 represents the RMS multipath in meters on the L1 pseudorange observable, averaged for a 50-point moving window (25 minutes for 30-s epochs).
- MP2 represents the RMS multipath in meters on the L2 pseudorange observable, averaged for a 50-point moving window (25 minutes for 30-s epochs).
- o/slp represents the average number of complete observations before a slip occurs simultaneously on the derivative of the ionospheric delay observable and/or both MP1 and MP2.
- IODslp represents the number of slips on the derivative of the ionospheric delay observable.

The TEQC statistics will be supplemented with those obtained by forming the ionospheric free linear combination of the L1 and L2 phases by the method of double differences. This is the method used by NGS to calculate daily site coordinates. Note that double differences are dependent on data quality from two sites, unlike TEQC statistics.

The combination of the aforementioned performance measures will be used to recommend equipment upgrades for prospective or existing site whose data under-perform that of its established peers (CORS network). In addition, these results will be used to search for systematic effects in the CORS network, such as a tendency for a model of receiver or antenna to under-perform its peers.

APPENDIX 1: Form for Evaluating New CORS

Form for Evaluating New CORS
Site Selection Committee

Updated: 9 September 2005

Information Received:

Digital Photographs

Photograph of view from antenna to North	YES/NO
Photograph of view from antenna to East	YES/NO
Photograph of view from antenna to South	YES/NO
Photograph of view from antenna to West	YES/NO
Photograph showing how the antenna is attached to the mount	YES/NO
Photograph showing the ground, monument (building/pillar), and mount And antenna	YES/NO
if the antenna is on a roof:	
Photograph showing how the antenna is attached to the building.	YES/NO
Photograph showing the antenna and the roof surface	YES/NO
Photograph of the whole building and the antenna	YES/NO
Photograph with the antenna serial number	YES/NO
Photograph of the receiver serial number	YES/NO
Photograph of the receiver location	YES/NO
3 days of raw data received	YES/NO
OPUS full solution received	YES/NO
Site log received	YES/NO

Assessment of submitted information:

Monument design

Obstructions	YES/NO
Required changes	
Recommended changes	
Ground Monument Pillar	
Top of pillar width narrower than antenna	YES/NO
Rooftop Monument	
Building made of mortar	YES/NO
Mount attachment bolts	YES/NO
Mount bolted length to free standing length	YES/NO
Leveling and orienting device	YES/NO

Antenna oriented to North	YES/NO
Antenna level	YES/NO
Antenna cable tension	YES/NO

Site Meta Data:
Site Log:

Detailed monument information described in section 1	
Description of materials used	YES/NO
Dimensions of equipment	YES/NO
Description of dimensions of foundations	YES/NO

Please give additional information on

Valid receiver type	YES/NO
Valid radome type	YES/NO
Valid antenna type	YES/NO
Valid antenna declination	YES/NO

Data quality:

Teqc results	YES/NO
Multipath skyplots	YES/NO
Cycle slips skyplots	YES/NO

Geographic Location:

Distance to nearest CORS	YES/NO
Map of proposed site and nearest CORS	YES/NO
Quality of existing CORS	YES/NO

Site is recommended as National/Cooperative/Neither

Site ID assigned YES/NO

APPENDIX 2: Instructions for Completing Site Log

Instructions for filling out NGS site logs
Modified by NGS from IGS version of Jul 2003

See log form at ftp://cors.ngs.noaa.gov/pub/Station_info/blank.log

General
=======

Please prepare site logs in plain ASCII.

Line length is limited to 80 characters.

When ready, submit site logs by sending as a plain text email message to ngs.corscollector@noaa.gov

Date and time formats within the site log follow the basic format "CCYY-MM-DDThh:mmZ" from ISO 8061; see
http://www.iso.ch/iso/en/prods-services/popstds/datesandtime.html
As a summary, CC=2 digit century
YY=2 digit year
MM=2 digit month
DD=2 digit day of month
T=date/time separator
hh=2 digit hour
mm=2 digit minutes of hour
Z=UTC indicator
/=separator when begin & end times are given

A date without a time is specified like "2003-07-30", not "2003-07-30Thh:mmZ"

Latitude/Longitude formats are aligned to ISO 6709:
Lat: +/-DDMMSS.SS
Long: +/-DDDMMSS.SS
A + or - sign is required. Leading zeroes must be used as appropriate to maintain the DDMMSS and DDDMMSS format.

Valid longitude range is from -180 degrees to (infinitesimally less than) +180 degrees. Valid latitude range is -90 degrees to +90 degrees.

"etc" indicates you may enter any relevant answer, not just a choice of the suggestions shown.

"F7.4," "A4" and so on indicate the FORTRAN-style format which the response should have.
Example 12345.7 = F7.1
ABED = A4

Blocks which have a "Nix" definition (namely sections 3-10) should always have the complete historic set of information; when a change is made, the previous information is left (for example in section 3.1) and the new information is placed in a new block numbered 3.2. Please leave the .x sections uncompleted to remind yourself of the format when the next change occurs.

Please remove the response hints such as "(F7.4 N/S)" as you fill out the log (except in the .x sections and Date Removed fields for currently installed equipment, which you must not alter). If an answer in an optional field is unknown, try to learn the answer for the next log update.

If you have any questions not answered here, please feel free to contact the NGS: ngs.corscollector@noaa.gov

Special Instructions by section
==========

0. Form

If Update:
Previous Site Log : (ssss_CCYYMMDD.log)
ssss = 4 character site name

If Update:
Modified/Added Sections : (n.n,n.n,...)
Enter the sections which have changed from the previous version of the log. Example: 3.2, 4.2

1. Site Identification of the GNSS Monument

Four Character ID : (A4)
This will be assigned by NGS

IERS DOMES Number : (A9)
This is NOT required. NGS may choose to assign one at a later time

Monument Description : (PILLAR/BRASS PLATE/STEEL MAST/FICTIVE/etc)
Enter one or more elements as necessary to describe the monument and mount.

Additional Information : (multiple lines)
Give a short paragraph description of the monument and mount used at your site. In particular describing the materials and methods used in building the monument.

2. Site Location Information

Approximate Position (ITRF)
This should be to a one meter precision. Use OPUS coordinates in ITRF. If the site is accepted official coordinates will be determined by NGS.

3. GNSS Receiver Information

Receiver Type : (A20, from rcvr_ant.tab; see instructions)
Please find your receiver at ftp://igscb.jpl.nasa.gov/pub/station/general/rcvr_ant.tab

and use the official name i.e. receiver type not description, taking care to get capital letters, hyphens, etc. exactly correct. If you do not find a listing for your receiver, please notify NGS: ngs.corscollector@noaa.gov

Serial Number : (A20)
Keep the 5 significant characters of the serial number field in SINEX in mind: do not enter "S/N 12345" instead of "12345" since valuable information will be lost. Ensure that 0(zero) are not O(ohs) or vice a versa).

Firmware Version : (A11)
Keep the 11 significant characters of the field in SINEX in mind. Ensure that 0(zero) are not O(ohs) or vice a versa).

Elevation Cutoff Setting : (deg)
Please respond with the tracking cutoff as set in the receiver, regardless of terrain or obstructions in the area. NGS requires that the receiver is set to 5 degrees or preferably 0 degrees.

Temperature Stabiliz. : (none or tolerance in degrees C.)
This refers to the temperature of the room in which the receiver is housed.

Date Removed : (CCYY-MM-DDThh:mmZ)
In the block for the receiver currently in operation, leave this line as is to remind yourself of the format when the next receiver change is made.

4. GNSS Antenna Information

Antenna Type : (A20; see instructions)
Please find your antenna type at
http://www.ngs.noaa.gov/ANTCAL/index.shtml
Do not enter the antenna description, taking care to get capital letters, hyphens, etc. exactly correct. If you do not find a listing for your antenna, please notify NGS (ngs.corscollector.gov).

Serial Number : (A20)
Do not enter "S/N 12345" instead of "12345" since valuable information will be lost. Ensure that 0(zero) are not O(ohs) or vice a versa).

Antenna Reference Point : BPA
Locate your antenna in the file
http://www.ngs.noaa.gov/ANTCAL/index.shtml
The arrow on the diagram for your antenna is the ARP. The most commonly used abbreviation used at NGS for this point is the BPA.

Marker->ARP Up Ecc. (m) : (F8.4)
Marker is the permanent and unique mark, dimple/cross hair, to which the antenna ARP is referenced. This is the antenna height measured to an accuracy of 1mm and defined as the vertical distance of the ARP from the mark described in section 1. If zero then enter 0.0000.

Marker->ARP North Ecc(m) : (F8.4)
Marker->ARP East Ecc(m) : (F8.4)
These must be filled in and will usually be 0.0000.

Alignment from True N : (deg; + is clockwise/east)

The positive direction is clockwise, so that due east would be equivalent to a response of "+90"

Antenna Radome Type : (A4 from rcvr_ant.tab; see instructions)

Place a radome code from
ftp://igscb.jpl.nasa.gov/pub/station/general/rcvr_ant.tab
"NONE" indicates there is no external radome. If an antenna has a cover which is integral and not ordinarily removable by the user, it is considered part of the antenna and "NONE" is to be used for the radome code.
Ensure that the antenna and radome pair are present in the NGS calibration page

Date Removed : (CCYY-MM-DDThh:mmZ)

In the block for the antenna currently in operation, leave this line to remind yourself of the format when the next antenna change is made.

5. Surveyed Local Ties

Local ties to other marks on the site should be determined in ITRF coordinates to 1mm precision in all 3 dimensions. Offsets are given in geocentric Cartesian coordinates (ITRF).

8. Meteorological Instrumentation

Height Diff to Ant : (m)

Positive numbers indicate met instrument is ABOVE GPS antenna.

12. Responsible Agency (if different from 11.)

The primary contacts listed here should always be the first choice for questions about operation of the site. This person will receive automated emails regarding site log or RINEX errors and should be someone who can answer questions about the configuration and data delivery for this site.

13. More Information

Primary Data Center :
Secondary Data Center :

If National CORS then Primary Data Center is
ftp://cors.ngs.noaa.gov/cors
If Cooperative CORS it is operators ftp or http RINEX file archive

URL for More Information :

This would be the site operator's web page if any additional information exists.

Additional Information:

Anything you feel is important. (This could also be kept at your local www site and referred to by URL in the log).

APPENDIX 3: Blank Site Log

```
   XXXX Site Information Form (site log)
   International GPS Service


0.   Form

   Prepared by (full name)  :
   Date Prepared           : (CCYY-MM-DD)
   Report Type              : (NEW/UPDATE)
   If Update:
    Previous Site Log      : (ssss_ccyymmdd.log)
    Modified/Added Sections : (n.n,n.n,...)


1.   Site Identification of the GNSS Monument

   Site Name              :
   Four Character ID       : (A4)
   Monument Inscription  :
   IERS DOMES Number       : (A9)
   CDP Number                 : (A4)
   Monument Description  : (PILLAR/BRASS PLATE/STEEL MAST/etc)
     Height of the Monument : (m)
     Monument Foundation    : (STEEL RODS, CONCRETE BLOCK, ROOF, etc)
     Foundation Depth      : (m)
   Marker Description      : (CHISELED CROSS/DIVOT/BRASS NAIL/etc)
   Date Installed         : (CCYY-MM-DDThh:mmZ)
   Geologic Characteristic  : (BEDROCK/CLAY/CONGLOMERATE/GRAVEL/SAND/etc)
     Bedrock Type         : (IGNEOUS/METAMORPHIC/SEDIMENTARY)
     Bedrock Condition    : (FRESH/JOINTED/WEATHERED)
     Fracture Spacing     : (1-10 cm/11-50 cm/51-200 cm/over 200 cm)
     Fault zones nearby   : (YES/NO/Name of the zone)
       Distance/activity    : (multiple lines)
   Additional Information   : (multiple lines)


2.   Site Location Information

   City or Town             :
   State or Province        :
   Country                  :
   Tectonic Plate         :
   Approximate Position (ITRF)
     X coordinate (m)      :
     Y coordinate (m)      :
     Z coordinate (m)      :
     Latitude (N is +)    : (+/-DDMMSS.SS)
     Longitude (E is +)  : (+/-DDDMMSS.SS)
     Elevation (m,ellips.)  : (F7.1)
   Additional Information   : (multiple lines)


3.   GNSS Receiver Information

3.1  Receiver Type              : (A20, from rcvr_ant.tab; see instructions)
```

```
   Satellite System          : (GPS/GLONASS/GPS+GLONASS)
   Serial Number           : (A20, but note the first A5 is used in SINEX)
   Firmware Version          : (A11)
   Elevation Cutoff Setting : (deg)
   Date Installed          : (CCYY-MM-DDThh:mmZ)
   Date Removed              : (CCYY-MM-DDThh:mmZ)
   Temperature Stabiliz.     : (none or tolerance in degrees C)
   Additional Information    : (multiple lines)

3.x  Receiver Type              : (A20, from rcvr_ant.tab; see instructions)
   Satellite System          : (GPS/GLONASS/GPS+GLONASS)
   Serial Number           : (A20, but note the first A5 is used in SINEX)
   Firmware Version          : (A11)
   Elevation Cutoff Setting : (deg)
   Date Installed          : (CCYY-MM-DDThh:mmZ)
   Date Removed              : (CCYY-MM-DDThh:mmZ)
   Temperature Stabiliz.     : (none or tolerance in degrees C)
   Additional Information    : (multiple lines)


4.   GNSS Antenna Information

4.1  Antenna Type           : (A20,; see instructions)
   Serial Number           : (A*, but note the first A5 is used in SINEX)
   Antenna Reference Point  : (BPA/BCR/XX; see instructions)
   Marker->ARP Up Ecc. (m)  : (F8.4)
   Marker->ARP North Ecc(m) : (F8.4)
   Marker->ARP East Ecc(m)  : (F8.4)
   Alignment from True N    : (deg; + is clockwise/east)
   Antenna Radome Type     : (A4 from rcvr_ant.tab; see instructions)
   Radome Serial Number  :
   Antenna Cable Type       : (vendor & type number)
   Antenna Cable Length  : (m)
   Date Installed          : (CCYY-MM-DDThh:mmZ)
   Date Removed              : (CCYY-MM-DDThh:mmZ)
   Additional Information    : (multiple lines)

4.x  Antenna Type           : (A20, from www.ngs.noaa.gov/ANTCAL/index.shtml)
   Serial Number           : (A*, but note the first A5 is used in SINEX)
   Antenna Reference Point  : (BPA/BCR/XX; see instructions.)
   Marker->ARP Up Ecc. (m)  : (F8.4)
   Marker->ARP North Ecc(m) : (F8.4)
   Marker->ARP East Ecc(m)  : (F8.4)
   Alignment from True N    : (deg; + is clockwise/east)
   Antenna Radome Type     : (A4 from rcvr_ant.tab; see instructions)
   Radome Serial Number  :
   Antenna Cable Type       : (vendor & type number)
   Antenna Cable Length  : (m)
   Date Installed          : (CCYY-MM-DDThh:mmZ)
   Date Removed              : (CCYY-MM-DDThh:mmZ)
   Additional Information    : (multiple lines)

5.   Surveyed Local Ties

5.x  Tied Marker Name        :
   Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
   Tied Marker CDP Number   : (A4)
   Tied Marker DOMES Number : (A9)
```

```
  Differential Components from GNSS Marker to the tied monument (ITRS)
    dx (m)                : (m)
    dy (m)                : (m)
    dz (m)                : (m)
  Accuracy (mm)           : (mm)
  Survey method           : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
  Date Measured           : (CCYY-MM-DDThh:mmZ)
  Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type              : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
     Input Frequency        : (if external)
     Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
     Notes                  : (multiple lines)

6.x  Standard Type              : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
     Input Frequency        : (if external)
     Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
     Notes                  : (multiple lines)


7.   Collocation Information

7.1  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
     Status                 : (PERMANENT/MOBILE)
     Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
     Notes                  : (multiple lines)

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
     Status                 : (PERMANENT/MOBILE)
     Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
     Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.1 Humidity Sensor Model   :
     Manufacturer         :
     Serial Number       :
     Data Sampling Interval : (sec)
     Accuracy (% rel h)  : (% rel h)
     Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
     Height Diff to Ant  : (m)
     Calibration date      : (CCYY-MM-DD)
     Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
     Notes                  : (multiple lines)

8.1.x Humidity Sensor Model   :
     Manufacturer         :
     Serial Number       :
     Data Sampling Interval : (sec)
     Accuracy (% rel h)  : (% rel h)
     Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
     Height Diff to Ant  : (m)
     Calibration date      : (CCYY-MM-DD)
     Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
```

```
    Notes                  : (multiple lines)

8.2.1 Pressure Sensor Model   :
    Manufacturer         :
    Serial Number       :
    Data Sampling Interval : (sec)
    Accuracy                : (hPa)
    Height Diff to Ant  : (m)
    Calibration date      : (CCYY-MM-DD)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                  : (multiple lines)

8.2.x Pressure Sensor Model   :
    Manufacturer         :
    Serial Number       :
    Data Sampling Interval : (sec)
    Accuracy                : (hPa)
    Height Diff to Ant  : (m)
    Calibration date      : (CCYY-MM-DD)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                  : (multiple lines)

8.3.1 Temp. Sensor Model       :
    Manufacturer         :
    Serial Number       :
    Data Sampling Interval : (sec)
    Accuracy                : (deg C)
    Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
    Height Diff to Ant  : (m)
    Calibration date      : (CCYY-MM-DD)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                  : (multiple lines)

8.3.x Temp. Sensor Model       :
    Manufacturer         :
    Serial Number       :
    Data Sampling Interval : (sec)
    Accuracy                : (deg C)
    Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
    Height Diff to Ant  : (m)
    Calibration date      : (CCYY-MM-DD)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                  : (multiple lines)

8.4.1 Water Vapor Radiometer  :
    Manufacturer         :
    Serial Number       :
    Distance to Antenna    : (m)
    Height Diff to Ant  : (m)
    Calibration date      : (CCYY-MM-DD)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                  : (multiple lines)

8.4.x Water Vapor Radiometer  :
    Manufacturer         :
    Serial Number       :
    Distance to Antenna    : (m)
    Height Diff to Ant  : (m)
```

```
    Calibration date      : (CCYY-MM-DD)
    Effective Dates       : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                 : (multiple lines)

8.5.1 Other Instrumentation   : (multiple lines)

8.5.x Other Instrumentation   : (multiple lines)


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.1 Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
    Observed Degradations  : (SN RATIO/DATA GAPS/etc)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Additional Information : (multiple lines)

9.1.x Radio Interferences     : (TV/CELL PHONE ANTENNA/RADAR/etc)
    Observed Degradations  : (SN RATIO/DATA GAPS/etc)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Additional Information : (multiple lines)

9.2.1 Multipath Sources   : (METAL ROOF/DOME/VLBI ANTENNA/etc)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Additional Information : (multiple lines)

9.2.x Multipath Sources   : (METAL ROOF/DOME/VLBI ANTENNA/etc)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Additional Information : (multiple lines)

9.3.1 Signal Obstructions     : (TREES/BUILDINGS/etc)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Additional Information : (multiple lines)

9.3.x Signal Obstructions     : (TREES/BUILDLINGS/etc)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Additional Information : (multiple lines)

10.  Local Episodic Effects Possibly Affecting Data Quality

10.1 Date                     : (CCYY-MM-DD/CCYY-MM-DD)
  Event                       : (TREE CLEARING/CONSTRUCTION/etc)

10.x Date                     : (CCYY-MM-DD/CCYY-MM-DD)
  Event                       : (TREE CLEARING/CONSTRUCTION/etc)

11.   On-Site, Point of Contact Agency Information

  Agency                   : (multiple lines)
  Preferred Abbreviation   : (A10)
  Mailing Address       : (multiple lines)
  Primary Contact
    Contact Name         :
    Telephone (primary)    :
    Telephone (secondary)  :
    Fax                       :
    E-mail                :
  Secondary Contact
    Contact Name         :
```

```
    Telephone (primary)    :
    Telephone (secondary)  :
    Fax                       :
    E-mail                 :
  Additional Information   : (multiple lines)
```

12. Responsible Agency (if different from 11.)

```
  Agency                    : (multiple lines)
  Preferred Abbreviation    : (A10)
  Mailing Address       : (multiple lines)
  Primary Contact
    Contact Name         :
    Telephone (primary)    :
    Telephone (secondary)  :
    Fax                       :
    E-mail                 :
  Secondary Contact
    Contact Name         :
    Telephone (primary)    :
    Telephone (secondary)  :
    Fax                       :
    E-mail                 :
  Additional Information   : (multiple lines)
```

13. More Information

```
  Primary Data Center    :
  Secondary Data Center  :
  URL for More Information :
  Hardcopy on File
    Site Map                  : (Y or URL)
    Site Diagram          : (Y or URL)
    Horizon Mask          : (Y or URL)
    Monument Description  : (Y or URL)
    Site Photographs          : (Y or URL)
  Additional Information   : (multiple lines)
  Antenna Graphics with Dimensions

  http://www.ngs.noaa.gov/ANTCAL/index.shtml
```

APPENDIX 4: Sample Site Log:

```
International GPS Service
   KNGS Site Information Form

0.   Form

   Prepared by (full name)  : Mike Craymer
   Date Prepared           : 2002-12-30
   Report Type              : UPDATE
   If Update:
    Previous Site Log      : kngs_20020918.log
    Modified/Added Sections : 1, 11


1.  Site Identification of the GNSS Monument

   Site Name              : Kingston
   Four Character ID       : KNGS
   Monument Inscription  : M023003
   IERS DOMES Number       : 40161M001
   CDP Number                 : N/A
   Monument Description  : Stainless steel plate
     Height of the Monument : N/A
     Monument Foundation    : Concrete block
     Foundation Depth      : N/A
   Marker Description      : Steel bolt
   Date Installed         : 2002-06-12
   Geologic Characteristic  : Bedrock
     Bedrock Type          :
     Bedrock Condition     :
     Fracture Spacing      :
     Fault zones nearby  : No
       Distance/activity    :
   Additional Information   : The GPS reference mark consists of a stainless
                              steel plate with a forced centering stainless
                              steel bolt embedded on top of a 8 m high, 25 cm
                              wide concrete abutment reportedly anchored to
                              bedrock. The concrete abutment acts as a door
                              frame for the City of Kingston, Portsmouth
                              Marina and Recreation Office.


2.   Site Location Information

   City or Town             : Kingston
   State or Province        : Ontario
   Country                  : Canada
   Tectonic Plate         : North American
   Approximate Position (ITRF)
     X coordinate (m)      : 1067510.934
     Y coordinate (m)      : -4452412.976
     Z coordinate (m)      : 4425573.166
     Latitude (N is +)    : 441307.28535
     Longitude (E is +)  : -0763102.15272
     Elevation (m,ellips.)  : 48.908
   Additional Information   : ARP  ITRF00 POSITION (EPOCH 1997.0)
```

```
                    : Computed in May, 2003 using 22 days of data.


3.  GNSS Receiver Information

3.1  Receiver Type              : TRIMBLE 5700
   Satellite System          : GPS
   Serial Number           : 0220268821
   Firmware Version          : NP 1.04/SP 0.00
   Elevation Cutoff Setting : 0 deg
   Date Installed          : 2002-06-12
   Date Removed              : CCYY-MM-DDThh:mmZ
   Temperature Stabiliz.     : None
   Additional Information    :

3.x  Receiver Type              : (A20, from rcvr_ant.tab; see instructions)
   Satellite System          : (GPS/GLONASS/GPS+GLONASS)
   Serial Number           : (A5)
   Firmware Version          : (A11)
   Elevation Cutoff Setting : (deg)
   Date Installed          : (CCYY-MM-DDThh:mmZ)
   Date Removed              : (CCYY-MM-DDThh:mmZ)
   Temperature Stabiliz.     : (none or tolerance in degrees C)
   Additional Information    : (multiple lines)


4.  GNSS Antenna Information

4.1  Antenna Type           : TRM41249.00
   Serial Number           : 12281766
   Antenna Reference Point  : BPA
   Marker->ARP Up Ecc. (m)  : 0.1000
   Marker->ARP North Ecc(m) : 0.0000
   Marker->ARP East Ecc(m)  : 0.0000
   Alignment from True N    : 0 deg
   Antenna Radome Type     : NONE
   Radome Serial Number  :
   Antenna Cable Type       : N/A
   Antenna Cable Length  : 17 m
   Date Installed          : 2002-06-12
   Date Removed              : CCYY-MM-DDThh:mmZ
   Additional Information    :

4.x  Antenna Type           : (A20, from rcvr_ant.tab; see instructions)
   Serial Number           : (A*, but note the first A5 is used in SINEX)
   Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
   Marker->ARP Up Ecc. (m)  : (F8.4)
   Marker->ARP North Ecc(m) : (F8.4)
   Marker->ARP East Ecc(m)  : (F8.4)
   Alignment from True N    : (deg; + is clockwise/east)
   Antenna Radome Type     : (A4 from rcvr_ant.tab; see instructions)
   Radome Serial Number  :
   Antenna Cable Type       : (vendor & type number)
   Antenna Cable Length  : (m)
   Date Installed          : (CCYY-MM-DDThh:mmZ)
   Date Removed              : (CCYY-MM-DDThh:mmZ)
   Additional Information    : (multiple lines)
```

```
5.  Surveyed Local Ties

5.x  Tied Marker Name       :
   Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
   Tied Marker CDP Number   : (A4)
   Tied Marker DOMES Number : (A9)
   Differential Components from GNSS Marker to the tied monument (ITRS)
     dx (m)                 :
     dy (m)                 :
     dz (m)                 :
   Accuracy (mm)            : (mm)
   Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
   Date Measured            : (CCYY-MM-DDThh:mmZ)
   Additional Information   : (multiple lines)


6.   Frequency Standard

6.1  Standard Type              : INTERNAL
     Input Frequency        :
     Effective Dates        : 2002-06-08/CCYY-MM-DD
     Notes                  :

6.x  Standard Type              : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
     Input Frequency        : (if external)
     Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
     Notes                  : (multiple lines)


7.   Collocation Information

7.x  Instrumentation Type     : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
     Status                 : (PERMANENT/MOBILE)
     Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
     Notes                  : (multiple lines)


8.   Meteorological Instrumentation

8.1.x  Humidity Sensor Model  :
     Manufacturer         :
     Serial Number       :
     Data Sampling Interval : (sec)
     Accuracy (% rel h)  : (% rel h)
     Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
     Height Diff to Ant  : (m)
     Calibration date      : (CCYY-MM-DD)
     Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
     Notes                  : (multiple lines)

8.2.x  Pressure Sensor Model  :
     Manufacturer         :
     Serial Number       :
     Data Sampling Interval : (sec)
     Accuracy                  : (hPa)
     Height Diff to Ant  : (m)
     Calibration date      : (CCYY-MM-DD)
```

```
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                  : (multiple lines)

8.3.x  Temp. Sensor Model      :
    Manufacturer         :
    Serial Number       :
    Data Sampling Interval : (sec)
    Accuracy                : (hPa)
    Aspiration             : (UNASPIRATED/NATURAL/FAN/etc)
    Height Diff to Ant  : (m)
    Calibration date      : (CCYY-MM-DD)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                  : (multiple lines)

8.4.x  Water Vapor Radiometer :
    Manufacturer         :
    Serial Number       :
    Distance to Antenna    : (m)
    Height Diff to Ant  : (m)
    Calibration date      : (CCYY-MM-DD)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Notes                  : (multiple lines)

8.5.x  Other Instrumentation  :


9.  Local Ongoing Conditions Possibly Affecting Computed Position

9.1.x  Radio Interferences    : (TV/CELL PHONE ANTENNA/RADAR/etc)
    Observed Degredations  : (SN RATIO/DATA GAPS/etc)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Additional Information : (multiple lines)

9.2.x  Multipath Sources       : (METAL ROOF/DOME/VLBI ANTENNA/etc)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Additional Information : (multiple lines)

9.3.x  Signal Obstructions    : (TREES/BUILDLINGS/etc)
    Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
    Additional Information : (multiple lines)


10.   Local Episodic Effects Possibly Affecting Data Quality

10.x Date                      : (CCYY-MM-DD/CCYY-MM-DD)
  Event                       : (TREE CLEARING/CONSTRUCTION/etc)


11.   On-Site, Point of Contact Agency Information

  Agency                    : Natural Resources Canada
  Preferred Abbreviation   : NRCan/GSD
  Mailing Address       : 615 Booth Street
  Primary Contact
    Contact Name         : Mike Craymer
    Telephone (primary)    : (613) 947-1829
    Telephone (secondary)  :
    Fax                       : (613) 992-6628
```

```
    E-mail                : craymer@nrcan.gc.ca
  Secondary Contact
    Contact Name         : Jason Silliker
    Telephone (primary)    : (613) 992-4367
    Telephone (secondary)  :
    Fax                       : (613) 992-6628
    E-mail                : jsillike@nrcan.gc.ca
  Additional Information   : (multiple lines)
```

12. Responsible Agency (if different from 11.)

```
  Agency                    : (multiple lines)
  Preferred Abbreviation   : (A10)
  Mailing Address       : (multiple lines)
  Primary Contact
    Contact Name         :
    Telephone (primary)    :
    Telephone (secondary)  :
    Fax                       :
    E-mail                :
  Secondary Contact
    Contact Name         :
    Telephone (primary)    :
    Telephone (secondary)  :
    Fax                       :
    E-mail                :
  Additional Information   : (multiple lines)
```

13. More Information

```
  URL for More Information :
    Hardcopy on File
    Site Map                  : (Y or URL)
    Site Diagram         : Y
    Horizon Mask         : Y
    Monument Description   : Y
    Site Pictures       : Y
  Additional Information   : (multiple lines)
  Antenna Graphics with Dimensions
```